

Listing of the Claims

1. (Currently Amended) A radio frequency coil (~~30, 30', 30'', 120, 120'~~) for a magnetic resonance imaging system (~~10, 10''~~), the radio frequency coil (~~30, 30', 120, 120'~~) comprising:

a birdcage section (~~34, 122, 122'~~) including a plurality of parallel spaced apart conductors (~~46, 130, 130'~~) and one or more end conductors (~~48, 132, 144', 154, 156~~) aligned generally transverse to the spaced apart conductors (~~46, 130, 130'~~), the birdcage section (~~34, 122, 122'~~) resonating at a birdcage resonant frequency; and

a TEM section (~~32, 32', 32'', 124, 124'~~) including a plurality of parallel spaced apart conductors (~~40, 40', 140~~) and a radio frequency screen (~~42, 142, 144, 144'~~), the TEM section (~~32, 32', 32'', 124, 124'~~) resonating at a TEM resonant frequency; wherein

the birdcage section (~~34, 122, 122'~~) and the TEM section (~~32, 32', 32'', 124, 124'~~) are relatively disposed with the parallel spaced apart conductors of each section aligned, the birdcage section (~~34, 122, 122'~~) and the TEM section (~~32, 32', 32'', 124, 124'~~) cooperatively defining a subject receiving region.

2. (Currently Amended) The radio frequency coil (~~30, 30', 30'', 120, 120'~~) as set forth in claim 1, wherein the parallel spaced apart conductors (~~46, 130, 130'~~) of the birdcage section (~~34, 122, 122'~~) and the parallel spaced apart conductors (~~40, 40', 140~~) of the TEM section (~~32, 32', 32'', 124, 124'~~) each include one or more electrically interconnected components selected from a group consisting of:

- a linear printed copper trace on a printed circuit board,
- a discrete capacitance, and
- a conductive rod.

3. (Currently Amended) The radio frequency coil (~~30, 30', 30'', 120, 120'~~) as set forth in claim 1, wherein the birdcage resonant frequency equals the TEM resonant frequency, the radio frequency coil (~~30, 30', 120, 120'~~) further comprising:

couplings (~~60, 62~~) between the birdcage section (~~34, 122, 122'~~) and the TEM section (~~32, 32', 32'', 124, 124'~~), the couplings (~~60, 62~~) cooperating with the birdcage section and the TEM section to define a volume resonator.

4. (Currently Amended) The radio frequency coil ~~(30, 30', 30'', 120, 120')~~ as set forth in claim 3, wherein the couplings ~~(60, 62)~~ are selected from a group consisting of:

- a radio frequency inductive transformer ~~(62)~~,
- a capacitive coupling ~~(60)~~,
- a coaxial half-wave cable, and
- overlapping portions of the birdcage and TEM sections.

5. (Currently Amended) The radio frequency coil ~~(30, 30', 30'', 120, 120')~~ as set forth in claim 1, further including:

- couplings ~~(80, 82)~~ selectively arranged between selected spaced apart conductors of at least one of the birdcage section ~~(34, 122, 122')~~ and the TEM section ~~(32, 32', 32'', 124, 124')~~; and
- at least one radio frequency transmit/receive means ~~(84)~~ for selectively defining an array of resonators,.

6. (Currently Amended) The radio frequency coil ~~(30, 30', 30'', 120, 120')~~ as set forth in claim 5, wherein the couplings include one of:

- phase-shifting impedances arranged between selected spaced apart conductors, and
- a decoupling impedance network ~~(80, 82)~~.

7. (Currently Amended) The radio frequency coil ~~(30, 30', 30'', 120, 120')~~ as set forth in claim 5, wherein the array of resonators define one of:

- a phased array of coils, and
- a SENSE coil array.

8. (Currently Amended) The radio frequency coil ~~(30, 30', 30'', 120, 120')~~ as set forth in claim 5, wherein the couplings ~~(80, 82)~~ include active switching components ~~(84)~~ actively switched to effect the selective arrangement of the coupling/decoupling between selected parallel spaced apart conductors of at least one of the birdcage section ~~(34, 122, 122')~~ and the TEM section ~~(32, 32', 32'', 124, 124')~~.

9. (Currently Amended) The radio frequency coil (~~30, 30'', 120, 120''~~) as set forth in claim 1, wherein:

the birdcage section (~~34, 122, 122''~~) has an arcuate cross-section transverse to the parallel spaced apart conductors (~~46, 130, 130''~~); and

the TEM section (~~32, 32'', 124, 124''~~) is substantially planar.

10. (Currently Amended) The radio frequency coil (~~30~~) as set forth in claim 1, further including:

a second birdcage section (~~34'''~~)—including a plurality of parallel spaced apart conductors (~~46'''~~) and one or more cross conductors (~~48'''~~)—aligned generally transverse to the spaced apart conductors (~~46'''~~), the second birdcage coil (~~34'''~~)—resonating at a second birdcage resonant frequency, the second birdcage section (~~34'''~~)—being interchangeable with the birdcage section (~~34~~)—such that the second birdcage section (~~34'''~~) and the TEM section (~~32~~)—are relatively disposed with the parallel spaced apart conductors of each section aligned, the second birdcage section (~~32'''~~) and the TEM section (~~32~~)—cooperatively defining the subject receiving region.

11. (Currently Amended) The radio frequency coil (~~120, 120''~~) as set forth in claim 1, wherein the radio frequency screen (~~142, 144, 144''~~) of the TEM section (~~124, 124''~~) includes:

a first screen portion (~~142~~) disposed adjacent the parallel spaced apart conductors of the TEM section (~~120, 120''~~); and

an endcap screen portion (~~144, 144''~~) transverse to the first screen portion (~~142~~) and transverse to the parallel spaced apart conductors (~~140~~) of the TEM section (~~120, 120''~~).

12. (Currently Amended) The radio frequency coil (~~120~~) as set forth in claim 11, wherein the parallel spaced apart conductors (~~130~~) of the birdcage section (~~122~~) are capacitively coupled with the endcap screen portion (~~144~~) of the radio frequency screen (~~142, 144~~) of the TEM section (~~120~~).

13. (Currently Amended) The radio frequency coil ~~(30'')~~ as set forth in claim 1, wherein the radio frequency screen ~~(22'')~~ includes:

a TEM screen portion ~~(22'')~~ coupled with the parallel spaced apart conductors ~~(40)~~ of the TEM section ~~(32'')~~; and

a shielding screen portion ~~(24)~~ connected with the TEM screen portion ~~(22'')~~, the shielding screen portion ~~(24)~~ extending around outside the birdcage section ~~(34)~~ and together with the TEM screen portion ~~(22'')~~ defining a shielding radio frequency screen inside of which the birdcage section ~~(34)~~ and the conductors ~~(40)~~ of the TEM section ~~(32'')~~ are disposed.

14. (Currently Amended) A magnetic resonance imaging scanner ~~(10, 10'')~~ including:

a radio frequency coil ~~(30, 30', 30'', 120, 120')~~ as set forth in claim 1 encompassing the subject receiving region;

a magnet ~~(44)~~ which generates a temporally constant main magnetic field through the subject receiving region; and

a plurality of magnetic field gradient coils ~~(46)~~ arranged to produce magnetic field gradients across the main magnetic field in the subject receiving region.

15. (Currently Amended) The magnetic resonance imaging scanner ~~(10, 10'')~~ as set forth in claim 14, wherein the radio frequency coil ~~(30, 30', 30'', 120, 120')~~ is further arranged with the conductive rods ~~(40, 40', 46, 130, 130', 140)~~ of the birdcage and TEM sections generally parallel to the main magnetic field.

16. (Currently Amended) The magnetic resonance imaging scanner ~~(10, 10'')~~ as set forth in claim 14, further including:

a subject supporting bridge ~~(26)~~ having slots ~~(56)~~ inside of which at least some of the parallel spaced apart conductors ~~(40)~~ of the TEM section ~~(32)~~ are disposed.

17. (Currently Amended) The magnetic resonance imaging scanner ~~(10)~~ as set forth in claim 14, further including:

a shielding radio frequency screen ~~(22, 24)~~ disposed around the radio frequency coil ~~(30, 30', 120, 120')~~ and spaced apart therefrom.

18. (Currently Amended) The magnetic resonance imaging scanner ~~(10, 10')~~ as set forth in claim 14, further including:

a second birdcage section ~~(34''')~~ including a plurality of parallel spaced apart conductors ~~(46''')~~ and one or more cross conductors ~~(48''')~~ aligned generally transverse to the spaced apart conductors ~~(46''')~~, the second birdcage coil ~~(34''')~~ resonating at a second birdcage resonant frequency, the second birdcage section ~~(34''')~~ being swappable for the birdcage section ~~(34)~~ of the radio frequency coil ~~(30)~~ such that the second birdcage section ~~(34''')~~ and the TEM section ~~(32)~~ are relatively disposed with the parallel spaced apart conductors of each section aligned, the second birdcage section ~~(32''')~~ and the TEM section ~~(32)~~ cooperatively defining the subject receiving region.

19. (Currently Amended) A radio frequency coil ~~(150)~~ comprising:

a birdcage section ~~(152, 154, 156)~~ including a plurality of parallel spaced apart conductors ~~(152)~~ and one or more cross conductors ~~(154, 156)~~ disposed generally transverse to the spaced apart conductors ~~(152)~~; and

a TEM radio frequency screen section ~~(158, 160)~~ including a radio frequency screen ~~(158)~~ coupled with the birdcage section ~~(152, 154, 156)~~ and having openings corresponding to spacings of the spaced apart conductors ~~152~~, and transparent or translucent dielectric material ~~(160)~~ disposed in the openings of the radio frequency screen ~~(158)~~, the transparent or translucent dielectric material ~~(160)~~ allowing an associated imaging subject disposed inside the coil ~~(150)~~ to see through the radio frequency coil ~~(150)~~.

20. (Currently Amended) The radio frequency coil ~~(150)~~ as set forth in claim 19, wherein the transparent or translucent dielectric material ~~(160)~~ is air.